



Synthesis and Characterization of Hematite-CNT Nanocomposite

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Background and Objectives:

Nano composite based-on-carbon offers numerous opportunities to make nano structures doped with additives are known as nanohybrid and are utilized in medicines, electronics, Polymers, ceramic. Particularly magnetic CNT composites are of much interest because of their potential applications in xerography, magnetic data storage and in magnetic force microscopy.

Carbon nano tubes (CNT) possess low density, very high strength and high chemical stability thus, this is the best candidate to synthesize nano-composite structures.

Hematite(α - Fe_2O_3) is a stable allotrope and less ferromagnetic as compared to others, magnetite, wustite(α - Fe_2O_3), magnetite(Fe_3O_4), maghemite(FeO) and widely used in the catalysts, gas sensor, pigments and photo-anode for solar cell.

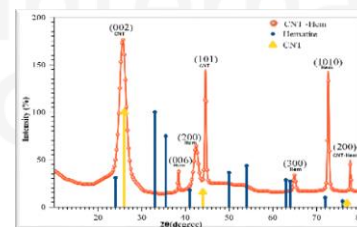
Chemically the modification are produced on the surface or interior of the CNT by the addition of another inorganic element such as Fe while size, shape and structural properties of the composite are dependent upon the technique employed for its synthesis.

Among others synthetic routes to produce nano structures chemical synthesis techniques are suitable with respect to its simplicity, cheapness and reproducibility.

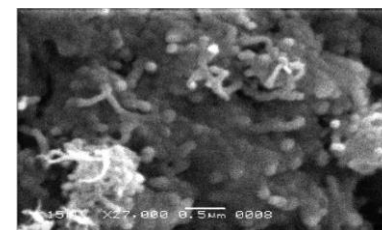
Experimental Method: The nanocrystal was obtained by single step method at annealing temperature 350 C and exclusively precipitation method employed under nitrogen atmosphere by using $\text{Fe}(\text{NO}_3)_3$ and NH_4OH with stirring and centrifuging for the synthesis of hematite nanoparticles.

Results/Discussion:

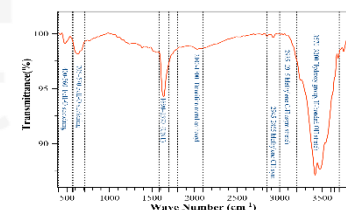
XRD:



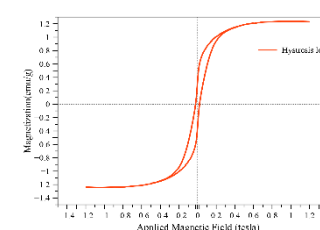
FTIR:



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VSM:



Conclusion: The desired nano composite were obtained by wet chemical method in such a manner that hematite sphere like structure maintained over the surface of CNT in the polycrystalline phase.

The average crystal size obtained by Debye Sherrer equation were 26 nm.

The nano composite were ferromagnetic in nature. This nano composite can be utilized in bio sensing application.

Reference:

- 1) S. F. Hasany, "Non-covalent assembly of maghemite-multiwalled carbon nanotubes for efficient lead removal from aqueous solution," Aust. J.Chem., 2013.
- 2) S. M. Tokarczyk, "Preparation and Characterization of Hematite-Multiwall Carbon Nanotubes Nanocomposite," 2015
- 3) J.Z. Chao Xu, Xin Wang, "Graphene-metal particle nanocomposites," Nanjing